

CLAIMS

1. A rolling method for a flat-rolled metal material, for executing rolling by using rolling equipment including a rolling mill and at least a pair of pinch rolls for clamping a rolled material on the exit side of said rolling mill having a construction in which either one, or both, of upper and lower roll assemblies have a mechanism for supporting a work roll, by split backup rolls split into at least three segments in an axial direction, said split backup roll group having a construction for supporting both a vertical direction load and a rolling direction load acting on said contacting work roll and each of said split backup rolls independently having a load measuring device, said method comprising the steps of:

directly measuring, or calculating on the basis of a predetermined measurement value, either one, or both, of a left-right balance of rolling direction force acting on a rolled material from said pinch rolls and a left-right balance of rolling direction force acting on the work roll of said rolling mill through the rolled material; and

controlling a left-right swivelling component of the roll gap of said rolling mill on the basis of the measured value or the calculated value of the left-right balance of the rolling direction force.

2. A rolling method for a flat-rolled metal material according to claim 1, wherein said pinch roll on the exit side of said rolling mill includes a pinch roll rotation driving device capable of applying a rolling traveling direction force to said rolled material so that a pinch roll torque generated from said driving device is controlled and tension is applied to said rolled material.

3. A rolling method for a flat-rolled metal material, for executing rolling by using rolling equipment including a rolling mill and a coiling device

for coiling a rolled material on the exit side of said rolling mill having a mechanism in which either one, or both, of the upper and lower roll assemblies support a work roll, by split backup rolls split into at least three segments in an axial direction, said split backup roll group having a construction for supporting both a vertical direction load and a rolling direction load acting on said contacting work roll, and each of said split backup rolls independently having a load measuring device, said method comprising the steps of:

calculating a left-right balance of a rolling direction force acting on the work roll of said rolling mill through the rolled material on the basis of a measured value of said split backup roll load of said rolling mill; and

controlling a left-right swivelling component of roll gap of said rolling mill.

4. A rolling apparatus for a flat-rolled metal material comprising:

a rolling mill having a construction in which either one, or both, of the upper and the lower roll assemblies have a mechanism for supporting a work roll, by split backup rolls split into at least three segments in an axial direction, said split backup roll group having a construction for supporting both a vertical direction load and a rolling direction load acting on said contacting work roll, each of said split backup rolls independently having a load measuring device;

a pair of pinch rolls arranged on the exit side of said rolling mill, for clamping said rolled material;

a calculation device for calculating a left-right balance of rolling direction force acting on the work roll contacting said split backup roll on the basis of a measured value of said split backup roll load of said rolling mill;

a calculation device for calculating a control quantity of a left-right swivelling component of roll gap of said rolling mill on the basis of the calculated value of the left-right balance of the rolling direction force;
5 and

a control device for controlling the roll gap of said rolling mill on the basis of the calculated value of the left-right swivelling component control
10 quantity of the roll gap.

5. A rolling apparatus for a flat-rolled metal material comprising:

a rolling mill having a construction in which either one, or both, of the upper and the lower
15 roll assemblies have a mechanism for supporting a work roll, by split backup rolls split into at least three segments in an axial direction, said split backup roll group having a construction for supporting both a vertical direction load and a rolling direction load
20 acting on said contacting work roll, each of said split backup rolls independently having a load measuring device;

at least one pair of pinch rolls arranged on the exit side of said rolling mill, clamping said
25 rolled material and having means for independently measuring a reaction of a rolling direction force acting between said pinch rolls and said rolled material on the operator side and on the driving side;

a calculation device for calculating a left-right balance of rolling direction force acting
30 between said rolled material and said pinch rolls from a measured value of said rolling direction reaction;

a calculation device for calculating a control quantity of a left-right swivelling component of
35 roll gap of said rolling mill on the basis of the calculated value of the left-right balance of the rolling direction force;

and

a control device for controlling the roll gap of said rolling mill on the basis of the calculated value of the left-right swivelling component control quantity of the roll gap.

6. A rolling apparatus for a flat-rolled metal material comprising:

a rolling mill having a construction in which either one, or both, of upper and lower roll assemblies support a work roll by split backup rolls split into at least three segments in an axial direction, said split backup roll group having a construction for supporting both a vertical direction load and a rolling direction load acting on said contacting work a roll, each of said split backup rolls independently having a load measuring device;

a coiling device for coiling said rolled material, arranged on the exit side of said rolling mill;

a calculation device for calculating a left-right balance of a rolling direction force acting on said work roll contacting said split backup rolls on the basis of the measured value of the split backup roll load of said rolling mill;

a calculation device for calculating a control quantity of a left-right swivelling component of roll gap of said rolling mill on the basis of the calculated value of the left-right balance of the rolling direction force;

and

a control device for controlling the roll gap of said rolling mill on the basis of the calculated value of the left-right swivelling component control quantity of the roll gap.